Adaptive Management, Monitoring, and Research

Chapter 7. Adaptive Management, Monitoring, and Research

Background and Context of Chapter

There is still much to be learned about the conservation of salmon habitat, but its uncertain future requires immediate action to stem its decline. As part of the implementation of this Action Agenda, research will be conducted to increase knowledge. Actions will be monitored to determine whether they are successful and why. Research and monitoring results will need to be applied as appropriate to future recommendations in the long-term salmon conservation plan.

Therefore, it is critical to create and use a formalized system of adaptive management. Adaptive management is an approach that incorporates research and monitoring to allow actions to be undertaken based on existing information and then modified as needed when new information becomes available. Adaptive management is the means by which those involved can learn from and build on the knowledge and experience gained from implementing projects and from conducting research recommended in the Action Agenda.

The main content of this chapter was modified from the Adaptive Management and Monitoring Program of the *Tri-County Model 4(d) Rule Response Proposal* (Snohomish, King, and Pierce Counties 2001). Some of the research questions come from the Watershed-Based Salmon Conservation Planning Program of the Tri-County Proposal. A more complete proposal for adaptive management, monitoring, and research will be developed as part of the strategic assessment and long-term conservation plan.

Research Needs

While the Action Agenda sets a pace for starting salmon conservation activities, there is an urgent need to learn more about the factors of salmon habitat decline and their roles and relationships in salmon conservation over the long term. Initial reconnaissance assessments and habitat-limiting factors reports have been completed, but the next step is to incorporate critical details through a strategic watershed and population assessment. This will provide a more complete scientific foundation on which to build the long-term salmon conservation plan.

Research will be needed to further address questions about the conditions of the watershed and salmon populations. For example, potential research questions may include (but are not limited to) the following:

Watershed Assessment

What are the causes of habitat loss and degradation?

- What are the watershed process, structure, and function links within the ecosystem for hydrology, sediment budgets, and stream habitat complexity?
- What are the impacts of land use on system processes, habitat, and functions from historic or reference conditions? What and where are the largest losses?
- What are the current and anticipated land uses in the watershed?
- Where are the locations of refuge areas within the watershed?
- What is the availability and quality of freshwater and nearshore salmon habitats and what is their connectivity?
- What are the habitat-forming processes and characteristics that have the most influence over salmon sustainability now? What will they be in the future?
- Which habitats appear to be limiting abundance and survival of salmon populations?

Population Assessment

- How might habitat changes have altered the abundance, diversity, spatial structure, survival, and productivity of individual populations?
- What is the relationship of habitat quality, quantity, and connectivity to fish abundance?
- What are the estimated current and historic juvenile and adult capacities?
- What is the relationship between habitat quality/quantity and fish productivity?
- What are independent populations, and what is the genetic relationship between populations?
- What is the abundance and distribution of freshwater and marine habitats, and what is the seasonal use of these habitats by adult and juvenile salmon?
- What is the natural history and behavioral ecology of chinook salmon in the highly altered and unique environment of the Lake Washington/Cedar/Sammamish Watershed?

- What are the rates and causes of mortality at each life history stage?
- What are the environmental and habitat requirements for each life history stage?
- What are the impacts of species interactions on salmon populations, particularly by non-native species?
- What are the effects and consequences of interactions between hatchery stock and wild stock?
- What are the consequences of harvest management decisions?
- What are the population relationships to the evolutionarily significant unit?

In addition, Chapter 4, Project and Research Recommendations Specific to Subareas, includes specific recommendations for research specific to subareas.

Monitoring Needs

Monitoring is necessary to assess the success of actions in conserving salmon habitat. To do this, monitoring is required at multiple levels:

- Compliance or implementation monitoring, done project by project. (Did proponents do what they said they would?)
- Effectiveness monitoring, done project by project as well as cumulatively across the watershed. (Are the actions improving habitat conditions?)
- Validation monitoring, done as part of the Puget Sound region's recovery effort. (Do all the actions taken together support the overall recovery of chinook salmon?)

Monitoring also will ensure that actions remain true to the objectives and guiding principles of the near-term strategy. The data gathered and analyzed through monitoring will need to be applied through an adaptive management system. The monitoring results should be shared with all conservation participants in the watershed so that everyone can benefit from the experience and information gained. Recommendations for tracking progress toward implementing the Action Agenda and sharing information with others are provided at the end of this chapter.

Adaptive Management Programs and Strategies

As a starting point, the Action Agenda endorses the concepts and principles articulated in the Monitoring and Adaptive Management Program of the *Tri-County Model 4(d) Rule Response*

Proposal (see http://www.salmoninfo.org/tricounty/vol3/chpt60518.doc). Effective adaptive management programs should be designed to produce the following outcomes:

- Knowledge of ecosystem processes and functions is increased.
- Roles and responsibilities are clearly defined and predictable and can be understood by managers as well as stakeholders.
- Relevant information is gathered, using appropriate quality controls, and is coordinated to evaluate management decisions and actions at the local, watershed, and regional levels.
- Institutional course corrections are made at predetermined milestones to ensure continual progress toward specific, measurable species recovery goals and habitat objectives.
- Institutional environments are improved as necessary, and ecosystem functions and processes are protected and restored.

In developing adaptive management components for Action Agenda recommendations, the following principles from the Tri-County program should be considered:

- *Precautionary principle.* In the absence of certainty, an environmentally protective approach should be taken.
- *Ecosystem understanding*. Management decisions should be consistent with current understanding of ecosystem processes and functions.
- Flexibility. Management systems should be dynamic and flexible enough to respond effectively to changes in the natural systems.
- Stakeholder investment. The adaptive management approach should gain essential stakeholder participation, agreement, and commitment.
 Stakeholders need to make a long-term commitment to the process, recognizing that salmon recovery is a long-term undertaking.

Key concepts of the Tri-County program guide implementation of a regional adaptive management program. The Tri-County program suggests that government institutions as well as biological systems need to be monitored for compliance. In order to protect natural resources and make efficient use of financial resources, the adaptive management program should guide local jurisdictions to intervene strategically to correct actions as necessary. Recommendations selected as part of the Action Agenda will need to be considered hypotheses that can be measured, evaluated, and modified as needed over time.

The Tri-County program was designed to provide guidance for long-term salmon conservation plans. Application of a monitoring and adaptive management program for the time frame of the Action Agenda must be scaled in scope and purpose to effectively examine the progress of actions implemented. Specific regional and watershed-wide processes and mechanisms addressing adaptive management have yet to be developed.

In the meantime, actions (particularly habitat restoration and improvement projects as well as revisions to policies and regulations) undertaken as part of the Action Agenda need to include the following monitoring and adaptive management components:

- Effectiveness and appropriateness of habitat improvement projects
- Funding and resource commitments to conduct monitoring
- Time frame for return of information
- Ability to respond to new information
- Goals, objectives, and hypotheses that are clearly articulated
- Indicators and variables to be measured
- Sampling protocols that can be standardized to allow comparison
- Procedures to ensure quality assurance and quality control of all data used
- Data management systems and databases.

In addition, implementers should consider the following guidelines for implementation of monitoring and adaptive management as modified from the Tri-County program:

General

• For each stage of the adaptive management strategy, describe the timelines, processes, and intermediate product descriptions for the work to be performed.

Regulatory Programs

- Restate the critical actions in each program as hypotheses in order to set the stage for direct effectiveness monitoring.
- Establish the parameters to be measured for direct effectiveness monitoring and cumulative effectiveness monitoring.

- Determine the intervals for measuring those parameters.
- Describe the process for reporting the results.
- Establish the timetable for sharing those results with third parties (federal, state, tribal, and local governments and other interested parties) at specified intervals for purposes of cumulative effectiveness monitoring.
- Describe the process for analyzing the results of such monitoring.
- Describe the process that will be used to determine whether those results will trigger course corrections.
- Once a course correction is made, begin the adaptive management cycle again, providing the information described above.

Compliance or Implementation Monitoring

- Describe the process that will be used to monitor institutional compliance.
- Specify the parameters to be measured.
- Specify the intervals at which those measurements will be made.

Direct Effectiveness Monitoring

- Describe the hypotheses that are to be tested.
- Determine which parameters will be monitored.
- Determine the intervals for measuring the parameters.
- Describe the process for reporting the results.
- Describe how those results will be used to inform and shape a new set of hypotheses at the end of the first adaptive management cycle.
- State who will construct the new set of hypotheses.
- Describe the objectives of this new round of monitoring.

Measurable Outcomes

The Action Agenda encourages the commitment of real dollars to real projects, but it does not measure progress toward a specific goal or quantify the results. Since the Action Agenda is a

menu of options that does not prescribe implementation methods or specific restoration goals, a suitable method of measuring outcomes does not yet exist. As funding is sought and political support is cultivated for actions locally, the ability to quantify progress toward the larger goal of salmon recovery will become necessary.

Tracking Successes and Sharing Information Gained from Implementing the Action Agenda

While the Action Agenda does not provide a schedule for implementation or specific restoration goals whose progress can be measured, there is still a need to track successes and share information as the Action Agenda is implemented. The work of each jurisdiction and organization in implementing projects, programs, and research, along with the information gained from monitoring these actions, will provide a firm foundation for the long-term salmon conservation plan. The following process is recommended to track successes, increase coordination, and allow jurisdictions and organizations to build on the experience and information gained by others.

Local governments should assign a point person to be responsible for tracking progress and successes within their own jurisdiction. As part of the meetings of the interjurisdictional WRIA 8 Staff Committee or other relevant group, jurisdictions should share their successes and lessons learned. This information can then be submitted to the WRIA 8 Steering Committee and WRIA 8 Forum. As appropriate, such information may be disseminated by the Public Outreach Committee through press releases, newsletters, and other tools to share these successes and lessons with the public. This process would continue until the conservation plan is completed.